# Toxicology

# Toxicology justification

- Reconstruction
- Determination of cause of death
  - Legal importance, insurance
- Assessment of current physical and waiver standards
- Detection of occult disease

# Carbon Monoxide (CO)

- **Normal level 1-3 %  (up to 10% in smokers)**
- **Fatal level at autopsy considered to be >50% for a healthy middle-aged male**
- **Interpretation of intermediate levels**
  - **health of the individual**
  - **time course of events**
  - **severity of other injuries**
  - **other evidence of fire**
  - **other evidence of CO exposure**

# Carbon Monoxide (CO)

- **Mishap pilot**
  - **CO 60%**
  - **No fatal injuries**
  - **3 other crewmembers with CO less than 10% and fatal injuries**
  - **Post-crash fire**
  - **Interpretation:  Pilot died in post crash fire**

# Carbon Monoxide (CO)

- **Mishap pilot**
  - **CO 35%**
  - **Instantaneously fatal injuries**
  - **No post-crash fire**
  - **Interpretation:  CO exposure in flight**

# Hydrogen Cyanide

- From burned plastics, rubber, natural fibers, insulation, polyurethane.
- Levels over 0.5 mg% can be incapacitating.

# Lactic Acid (CNS/gray matter)

- High levels once thought to indicate CNS hypoxia
- Now considered too non-specific to interpret
- No longer part of the routine assay

# ALCOHOL

- Assayed in all aircraft fatalities, preferably in two tissues
- Postmortem alcohol interpretation is more complex than premortem
  - Contaminating substances (fuels)
  - Postmortem bacterial production
- Difficulty in applying constant metabolism rates

# Alcohol

- Bacterial production
  - Levels up to 0.06%, however, levels up to 0.20% have been documented
  - Generally produce other volatiles, which are assayed in most postmortem labs

# ALCOHOL

- Consider
  - Condition of tissue
  - Interval/presence of decomposition
  - Entire chromatogram
    - Other volatiles, such as butanol and propanol may indicate bacterial source
  - 72 hr history
  - Flight surgeon input

# ALCOHOL

- Formulas to calculate how much a person drank based on a blood ETOH level are only approximations and can be altered by several factors:
  - Length of time between consumption and death
  - postmortem production
  - postmortem degradation

# Drugs of abuse

- Immunoassay
  - Traditional drugs of abuse
  - GHB
  - Very rare positives

# Therapeutic drugs

- Alkaline extractable drug screen
  - Antihistamines
  - Sympathomimetic amines
  - Benzodiazapines
  - Narcotic analgesics
  - Some beta blockers
  - Calcium channel blockers
  - Antidepressants
  - Some neuroleptics
  - Barbiturates
  - Dilantin

# Practical aspects

- Specimen collection--fluids
  - Blood:  All available up to 100 mL
    - Indicate central or peripheral
  - Urine:  100 ml (no preservative)
  - Bile:  All available
  - Vitreous:  All available
  - Gastric contents:  50 grams

# Practical aspects

- Specimen collection--soft tissue
  - Liver:  100 grams
  - Brain:  100-200 grams
  - Kidney:  50 grams
  - Lung:  50 grams
  - Spleen:  50 grams

# Practical aspects

- Antemortem samples
  - Hospital specimens--clearly label
- Collection timing
  - Best when collected at autopsy
- Specific requests

# Practical considerations

- Packaging and preservation
  - www.afip.org
- Shipment instructions
  - www.afip.org
- Labelling and chain of custody
  - www.afip.org

# Interpretation

- Detection vs impairment
- Tissue vs blood levels
- Postmortem alterations
- For help with interpretation, AFIP offers
  - Forensic toxicologists
  - Medical examiners

Call us!!!!